

The Journey Toward a Smarter, Safer, and Connected World With IMS2021 Technical Program

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Greetings from the 2021 IEEE Microwave Theory and Techniques Society (MTT-S) International Microwave Symposium (IMS2021) Technical Program Committee (TPC) cochairs! IMS is the premier conference of the MTT-S and draws many academic and industrial technologists and researchers from around the world who are inter-

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ested in the latest advances in theory, techniques, devices, systems, and applications spanning megahertz-to-terahertz (MHz-to-THz) frequencies.

This year, IMS is scheduled to be held in Atlanta, Georgia, on 6–11 June. The theme of IMS2021 is “Connecting for a Smarter, Safer World.”

Due to the unprecedented COVID-19 global pandemic, travel restrictions, and related uncertainties, IMS2021 will be held as a hybrid conference. The TPC is planning for a virtual program in addition to the usual live, in-person sessions at the Georgia World Congress Center, Atlanta. Authors of papers selected for both the oral sessions and the interactive forums (IFs) must provide prerecorded videos and slides for IMS2021 presentation; they should also plan to present their papers at the technical sessions, whether live or recorded, and must be present to answer attendee questions. The organizational details of the live and virtual technical sessions and other events are being planned and coordinated with the IMS2021 conference management team.

The IMS2021 technical program will include the following events: oral technical, IF, and focus/special sessions; workshops; Technical Lectures; the Student Paper Competition (SPC), Industry Paper Competition (IPC), Advanced Practice Paper Competition (APPC), and Three Minute Thesis (3MT) Competition; panel/rump and Microwave Applications (MicroApps) sessions; industry workshops; and the Connected Future Summit.

IMS2021 Technical Areas

The IMS2021 technical program covers 35 technical areas divided into the following five categories:

- electromagnetics, devices, and circuit technologies
- passive components and packaging
- active devices
- systems and applications
- emerging technologies.

The technical sessions will be identified with color-coded tracks, and attendees will be able to easily identify their sessions of interest.

New Initiatives to Enhance IMS Technical Programs

In an effort toward further improving the quality of future IMS technical programs, the IMS2021 TPC has implemented several changes to the

Technical Program Review Committee (TPRC) membership and technical areas. The IMS2021 TPC cochairs are also working with the *IEEE Microwave and Wireless Components Letters (MWCL)* editorial office to create an *MWCL* special issue dedicated to IMS2021.

Diverse TPRC Membership

To increase high-quality paper submissions at future IMS conferences, we have made an active effort to solicit and attract new researchers from both industry and academia. The IMS2021 TPC has worked toward recruiting new TPRC members. We have reached out and invited talented technologists and practitioners from industry to encourage more industry paper submissions. We also tried to attract eligible TPRC members from the Latin America and South Asia regions.

We evaluated each submitted application and selected a diverse group of 265 experienced researchers, including many young professionals, to participate in the IMS2021 TPRC. Furthermore, we encouraged these new TPRC members to engage in the MTT-S community and help increase the submission of quality papers to future IMS conferences. We continued the process of elevating senior TPRC members to senior advisors to assist with the paper review, selection process, and creation of high-quality IMS technical sessions.

New and Updated Technical Areas

We have reviewed and updated the technical areas for IMS2021 to replace “microwave” with “MHz-to-THz” and realigned the contents of the existing 32 subcommittees (SCs) to track recent changes in technology and research directions. We have also introduced three new SCs on emerging technologies and applications related to the MTT-S scope. The three new SCs on emerging technologies and applications are as follows:

- SC-33—*MHz-to-THz Physical Layer Security*: devices, circuits,

and systems for secured communication and sensing from MHz to THz, addressing general security vulnerability due to electromagnetic emissions; hardware and software code-sign for physical layer security; advanced devices and materials to enhance RF, millimeter-wave (mm-wave), and THz physical layer security; and trusted design, fabrication, packaging, and validation for RF, mm-wave, and THz electronics

- SC-34—*Artificial Intelligence/Machine Learning (AI/ML) for RF and mm-Wave*: AI/ML algorithms, implementations, and demonstrations for spectrum sensing, mobile edge networking, and multiple input/multiple output and array beam operations and management; AI/ML algorithms for the design and optimization of RF/mm-wave components, circuits, and systems; and AI/ML algorithms for in situ sensing, diagnostics, control, reconfiguration, and optimization of MHz-to-THz communication and sensing circuits and systems
- SC-35—*Quantum Devices, Systems, and Applications*: cryogenic RF devices, circuits, and systems for general quantum device interfacing and quantum computing applications.

New MWCL Special Issue on Selected IMS2021 Papers

In collaboration with the *MWCL* editorial office, the IMS2021 TPC cochairs have implemented a process to publish selected top IMS2021 papers in an *MWCL* special issue. *MWCL* publishes four-page papers (three pages of text plus up to one page of references) that focus on microwave theory, techniques, and applications related to components, devices, circuits, biological effects, and systems involving the generation, modulation, demodulation, control, transmission, and detection of microwave signals. Therefore, IMS and *MWCL* share the same technical

scopes, and this *MWCL* special issue will greatly benefit IMS authors and *MWCL* readers.

About 50 IMS2021 papers will be selected by the IMS2021 TPRC SCs for *MWCL* editorial review. Upon selection, the corresponding IMS2021 authors will receive email invitations to publish their IMS papers in the *MWCL* special issue “Top IMS2021 Papers.” If IMS2021 authors opt to publish their papers in the *MWCL* special issue, once selected by the IMS TPRC SCs, an updated IMS paper must be submitted directly to *MWCL* before the deadline, with all of the review comments from the TPRC SCs addressed. If a paper is not in compliance, it will revert to the *IMS2021 Digest*. The papers in compliance will continue through a quick but standard *MWCL* review process (not a double-blind review). Any rejected papers from this special issue review process will also revert to the *IMS2021 Digest*.

After the *MWCL* review, those papers accepted will be published in the *MWCL* “Top IMS2021 Papers” special issue on *IEEE Xplore* with a citation of the IMS2021 presentations. IMS proceedings on *IEEE Xplore* will not include the selected *MWCL* special issue papers but will contain a list of these papers to indicate their publication in *MWCL*. The authors of those *MWCL* special issue papers can further extend their work as journal papers for the traditional IMS special issue in *IEEE Transactions on Microwave Theory and Techniques (T-MTT)*, following the same guidelines as for other IMS2021 papers.

The authors of the *MWCL* “Top IMS2021 Papers” special issue should also follow the same guidelines for regular IMS2021 paper presentations, including the preparation of prerecorded videos and presentation slides. Authors must present their papers at the live or virtual IMS2021 events and be available to answer questions from attendees. The papers without presentations will be removed from the *MWCL* publication and the list of IMS2021 accepted papers.

Continuation of Existing Technical Program Features

IMS2021 Late-Breaking News Paper

IMS2021 invites authors to submit postdeadline technical papers describing late-breaking original work in MHz-to-THz theory and techniques. Postdeadline papers are intended to showcase late breakthroughs with high-impact experimental results, technology innovations, and/or system-level demonstrations. They are also meant to report significant advancements and will be subject to the same standard paper selection criteria.

The postdeadline IMS2021 papers will not undergo double-blind review due to the tight schedule. Accepted postdeadline IMS2021 papers will be eligible to compete for the appropriate best paper awards, 3MT Competition, and *MWCL* “Top IMS2021 Papers” special issue.

T-MTT Special Issue

Authors of all papers presented at IMS2021, including the postdeadline late-breaking news papers, are eligible to submit expanded versions of their IMS papers to the IMS2021 special issue of *T-MTT*. It is required that sufficient new technical materials be added beyond the IMS2021 papers to be qualified for the *T-MTT* special issue. Please refer to <https://www.ims-ieee.org> for details.

IMS2021 Technical Program Status

By the regular deadline of 9 December 2020, IMS2021 had received a total of 479 paper submissions, indicating a 35% decline in paper submission from last year. A similar drop was observed for other related conferences, such as the 2021 Radio Frequency Integrated Circuits (RFIC) Symposium.

One can reasonably guess that such a reduced submission count might be the result of the unprecedented COVID-19 pandemic, as many academic institutions as well as industrial research labs faced difficulties continuing their

research and completing measurements in time for IMS2021 paper submission. The COVID-19 pandemic has also resulted in travel restrictions and budget constraints, and many of our MTT-S members have been through personal hardship. These challenges very likely have further impacted paper submissions. The IMS2021 TPRC eventually selected a total of 247 papers, with about a 51.6% acceptance rate.

Thus, we believe that it has become essential for IMS2021 to offer our authors the opportunity to submit papers as late-breaking news and support them through this challenging time of the COVID-19 pandemic. We expect to receive more high-quality papers as late-breaking news submissions.

Regular Technical Sessions

Authors were notified of the accept/reject decisions on their papers by email on 26 January 2021, about two weeks earlier than the actual notification date of 10 February 2021. TPRC members created 40 regular technical sessions from 184 accepted papers. These technical sessions, distributed throughout the three-day technical program, are 100 or 80 min in duration, with combinations of 20- and 10-min paper presentations (including Q&A).

Focus/Special Sessions

The Focus and Special Session Committee selected 18 papers, accepted after TPRC review, to form four focus sessions, highlighting topics of growing importance and great interest to the MTT-S community. The four focus session topics are as follows:

1. TU1A: “Emerging ML Techniques for CAD of RF/Microwave Circuits”
2. TU2B: “Additive Manufacturing-Based RF Sensors and RFIDs for Rugged Internet of Things and Digital Twins in Smart Cities”
3. WE2B: “Heterogeneous and High-Density Flex RF Package Integration”
4. WE3D: “Advances in Phase-Change Materials for Microwave Applications.”

A special session in memory of Dr. Robert J. Trew is being organized and

will be held on Thursday morning of Microwave Week.

IF/Poster Sessions

Two IF or poster sessions were created with 45 papers selected by the review committee. The first session will be held on Wednesday afternoon and the second on Thursday morning of Microwave Week.

Workshops

The IMS2021 TPC is responsible for organizing the review of Microwave Week workshops and Technical Lectures. This year, the workshop chairs collaborated closely with RFIC2021 and ARFTG2021 workshop chairs and created a high-quality workshop program spanning the wide range of technical areas in the MTT-S community. The team selected 32 workshops (26 full-day and six half-day sessions) covering many aspects of MTT-S-related topics: from materials and devices to design, prototypes, assembly, and testing/characterization of circuits to subsystems and large systems and platforms to emerging technologies and applications. Additional details of the workshops are described by the IMS2021 Workshop Committee in this special IMS2021 issue of *IEEE Microwave Magazine*.

Technical Lectures

In addition to the workshops, IMS2021 will organize three Technical Lectures on system-level topics: radar, imaging, and wireless communications. The Technical Lectures are focused presentations on fundamental concepts for topics of broad relevance to the MTT-S community. IMS2021 Technical Lecture cochairs have included a detailed column on the selected Technical Lectures in this IMS2021 special issue.

IMS2021 Competitions

Papers nominated by the IMS2021 TPRC SCs will be eligible for four different competitions to be held during Microwave Week.

- *SPC*: Finalists were nominated by the SCs during the January TPRC paper review meeting. The tech-

nical merits of these SPC papers will be evaluated by a committee of judges at a special SPC session during the IF. The finalists will present posters of their papers in addition to their regular technical session presentations. The IMS2021 TPRC selected 48 finalists for the SPC, and additional exceptional late-breaking news papers will be selected and added to this list.

- *3MT Competition*: IMS2021 will continue the tradition of the 3MT Competition designed for students and young professionals. The competition finalists are nominated by TPRC SCs from the authors of the accepted papers who indicated, at the time of paper submission, their desire to enter the 3MT Competition. The IMS2021 TPRC selected 37 papers for the 3MT Competition, and additional nominations from late-breaking news papers will be added to this list as well.
- *IPC and APPC*: Of these two other IMS2021 paper competition categories, authors had the opportunity to select either or both during the paper submission process. An IPC paper from the RF/microwave/mm-wave industry describes the innovation of a product or system application that has the highest potential impact and that will significantly benefit the MTT-S community and society as a whole. In contrast to basic research, an APPC paper describes a practical RF/microwave/mm-wave design, integration technique, process enhancement, or their combination that results in a significant improvement to performance or production time needed to produce RF/microwave/mm-wave components, subsystems, or systems. The IMS2021 TPRC selected 14 and 22 papers for IPC and APPC, respectively.

Connected Future Summit

Since its inception at IMS2017 in Honolulu, Hawaii, the 5G Summit has been held during Microwave Week. It

provides a platform for the academic and industrial communities to interact and exchange technology ideas related to 5G and beyond. The 5G Summit Committee is part of the IMS TPC and is responsible for selecting timely topics and inviting speakers to create an agenda. This event has received sponsorships from industry, with encouraging attendance every year (375 attendees in 2017, 412 in 2018, 278 in 2019, and 350 virtual attendees in 2020).

The wireless connectivity landscape is changing rapidly with the evolution of Wi-Fi and the move to connect the unconnected via broadband wireless with low-Earth-orbit (LEO) satellite constellations. The 5G standardization, deployment, and R&D of the next generations are impacting the future directions of connectivity in coordination with beyond-Wi-Fi-7 technologies, LEO satellite-based wireless networks such as Starlink and Kuiper, and autonomous vehicle-to-everything communication.

As 5G deployments are being planned, IMS2021 will host the Connected Future Summit, replacing the 5G Summit, to create a new platform for discussing various connectivity technologies and applications as well as the coexistence of different wireless standards to enable a safer and smarter world. The planned Connected Future Summit will review core technologies for future wireless networks along with their human and societal impacts.

Concluding Remarks

This special issue of *IEEE Microwave Magazine* is dedicated to IMS2021 activities. It contains a range of columns with additional details on various aspects of the IMS2021 technical program, such as the focus/special sessions, panel sessions, workshops and Technical Lectures, various paper competitions, MicroApps sessions, and exhibitor workshops. The excellent IMS2021 technical program could not be achieved without the enthusiastic efforts of the outstanding TPC and TPRC teams. Their dedication and service to IMS2021, the MTT-S, and the RF/microwave/mm-wave/THz community are greatly appreciated. 